

### **REMARKS**

A Petition and Fee for One Month Extension of Time is submitted herewith.

Claims 1-7, 17-16, 28 and 31-38 are all the claims presently pending in the application. Claims 1-2, 6 and 26 have been amended to more particularly define the invention. Claims 36-38 have been added to claim additional features of the claimed invention.

It is noted that the claim amendments are made only for more particularly pointing out the invention, and not for distinguishing the invention over the prior art, narrowing the claims or for any statutory requirements of patentability. Further, Applicant specifically states that no amendment to any claim herein should be construed as a disclaimer of any interest in or right to an equivalent of any element or feature of the amended claim.

Applicant respectfully acknowledges that claims 17-25 and 32-35 are allowed.

Applicant respectfully submits that all of the claims are allowable.

Claims 1-6, 26 and 28 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Ito (U.S. Patent No. 6,320,683). Claims 7 and 31 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Ito in view of Tanaka (U.S. Patent No. 6,301,028).

These rejections are respectfully traversed in the following discussion.

#### **I. THE CLAIMED INVENTION**

The claimed invention (e.g., as defined, for example, in claim 1) is directed to a hologram recording medium which includes a photo refractive crystal of a uniaxial crystal having surfaces in a shape of parallel flat plates. The photo refractive crystal includes a plurality of areas of a refractive index grating corresponding to one portion of a three-dimensional light interference pattern of a coherent signal light beam and coherent reference light of a first wavelength modulated in accordance with information data. Importantly, the areas of the refractive index grating have a columnar shape, and are adjacently arranged in parallel with each other.

In a conventional hologram recording and reproducing apparatus, a signal light beam is made incident to one surface of a recording medium, and a reference light beam is made incident to another surface of the recording medium (Application at Figure 1). The reference light beam crosses the optical path of the signal light beam within the recording medium so

that an interference pattern is formed. The entire interference pattern is recorded as a change in refractive index (Application at page 2, lines 14-20). However, such conventional methods resulted in a recording medium having a limited recording density (Application at page 4, lines 8-24).

The claimed invention, on the other hand, includes a recording medium in which the areas of the refractive index grating have a columnar shape, and are adjacently arranged in parallel with each other. (Application at Figure 5; page 29, lines 8-23). This results in the inventive hologram recording medium having a higher recording density than in conventional hologram recording media (Application at page 40, line 8-page 41-line 4).

## II. THE PRIOR ART REFERENCES

### A. The Ito Reference

The Examiner alleges that Ito teaches the claimed invention of claims 1-6, 26 and 28. Applicant submits, however, that there are elements of the claimed invention which are neither taught nor suggested by Ito.

Ito discloses an optical information recording and reproducing apparatus which detachably supports a volume holographic memory formed of a photorefractive crystal. The apparatus includes a scanning portion for moving an intersecting region in which the gate light beam, the signal light beam and the reference light beam intersect with one another within the volume holographic memory along an optical axis of an optical path of the signal light beam within the volume holographic memory (Ito at Abstract).

However, contrary to the Examiner's allegations, Ito does not teach or suggest "*wherein the areas of said refractive index grating have a columnar shape, and are adjacently arranged in parallel with each other*" as recited in claim 1 and similarly recited in claim 26.

As noted above, unlike a conventional hologram recording and reproducing apparatus, which results in a recording medium having a limited recording density, the claimed invention includes a recording medium in which the refractive index grating areas have a columnar shape and are adjacently arranged in parallel with each other (Application at Figure 5; page 29, lines 8-23). This results in the inventive hologram recording medium having a

higher recording density than in conventional hologram recording media (Application at page 40, line 8-page 41-line 4).

Clearly, these novel features are not taught or suggested by Ito. For example, with respect to claim 26, Ito clearly fails to disclose or suggest at least (1) a phase conjugate wave recited at the end of claim 26, and (2) a converged recording reference light beam also recited in claim 26. Furthermore, it is noted that Ito fails to disclose or suggest a mirror that is arranged at (or near) the beam waist of the converged reference light beam, although a mirror reflecting reference light may be disclosed therein.

In addition, Applicant notes that the Examiner attempts to rely on Figure 4 and col. 5, lines 7-8 of Ito to support his allegations. However, the Examiner is clearly incorrect.

In fact, Figure 4 of Ito merely shows a gate light beam and a reference light beam which are not perpendicular to the surface of the recording medium. Instead, these light beams are incident to the surface of the recording medium at an acute angle.

Moreover, Figure 4 shows that in the Ito apparatus, the signal light beam, reference light beam and gate light beam form an intersecting region which has a diamond-like shape. That is, the intersecting region is not columnar. Moreover, in col. 7, Ito describes the intersecting region "P" in Figure 4, and nowhere does Ito here teach or suggest that the intersecting region may have a columnar shape (Ito at col. 7, lines 44-64). Thus, contrary to the Examiner's allegations, Figure 4 clearly does not teach or suggest a recording medium having refractive index grating areas with a columnar shape which are adjacently arranged in parallel with each other.

Further, neither does Ito teach or suggest this feature at col. 5, lines 7-8. Indeed, this passage merely describes the volume holographic memory 10 as having "a cylindrical body. Applicant respectfully submits that this may be true (e.g., see Figure 3 of Ito). However, the holographic memory 10 is not equal to a "refractive index grating area". Instead, by "holographic memory" Ito is referring to the entire recording medium, as illustrated in Figure 3. Clearly, these does not suggest any particular shape of the the intersecting region "P" or a refractive index grating area.

Therefore, Applicant submits that there are elements of the claimed invention that are not taught or suggest by Ito. Therefore, the Examiner is respectfully requested to withdraw this rejection.

**B. The Tanaka Reference**

The Examiner alleges that Ito would have been combined with Tanaka to form the claimed invention of claims 7 and 31. Applicant submits, however, that these references would not have been combined and even if combined, the combination would not teach or suggest each and every element of the claimed invention.

Tanaka discloses an optical information recording and reproducing apparatus employing a holographic memory. The center of a region of the holographic memory where the signal light beam and the reference light beam intersect with each other, is shifted by a distance substantially equal to twice the distance between peaks of the zeroth-order diffracted light or the first-order diffracted light of the signal light beam (Tanaka at Abstract).

However, Applicant submits that these references would not have been combined as alleged by the Examiner. Indeed, these references are directed to different problems and solutions.

Specifically, Ito is directed to a apparatus having a mechanism for moving the intersecting region (Ito at col. 8, lines 62-65), whereas Tanaka is merely intended to increase recording density by shifting an intersecting region by a distance equal to twice the distance between peaks of the zeroth-order or first-order diffracted light of the signal beam. Therefore, these references are completely unrelated, and no person of ordinary skill in the art would have considered combining these disparate references, absent impermissible hindsight.

Further, Applicant submits that the Examiner can point to no motivation or suggestion in the references to urge the combination as alleged by the Examiner. Indeed, the Examiner merely states that it would have been obvious to combine these references “for the purpose of concentrating the information near the zeroth-order signal.

However, contrary to the Examiner’s allegations, nowhere do these references teach or suggest that any benefit would be gained by their combination. In fact, neither of these references teach or suggest their combination. Therefore, Applicant respectfully submits that one of ordinary skill in the art would not have been so motivated to combine the references as alleged by the Examiner. Therefore, the Examiner has failed to make a prima facie case of obviousness.

Moreover, neither Tanaka, nor Ito, nor any combination thereof teaches or suggests “*wherein the areas of said refractive index grating have a columnar shape, and are*

*adjacently arranged in parallel with each other”* as recited in claim 1 and similarly recited in claim 26.

As noted above, unlike conventional recording media, the claimed invention includes a recording medium in which the refractive index grating areas have a columnar shape and are adjacently arranged in parallel with each other (Application at Figure 5; page 29, lines 8-23). This results in the inventive hologram recording medium having a higher recording density than in conventional hologram recording media (Application at page 40, line 8-page 41-line 4).

Clearly, these novel features are not taught or suggested by Tanaka. Indeed, the Examiner has not even alleged that Tanaka teaches or suggests this feature. Instead, the Examiner merely relied on Tanaka as allegedly disclosing a maximum inside diameter of the areas of a refractive index grating which is smaller than the distance between peaks of zeroth-order and primary diffracted lights of a light intensity distribution of the signal light beam.

In fact, nowhere does Tanaka teach or suggest a recording medium having refractive index grating areas with a columnar shape which are adjacently arranged in parallel with each other. Indeed, like Ito, Tanaka merely discloses a cylindrical holographic memory (e.g., recording medium). As explained above, this cannot be equated with a columnar-shaped refractive index grating area as in the claimed recording medium. Therefore, Tanaka fails to make up for the deficiencies of Ito.

In addition, with respect to claims 7 and 31, Applicant points out that Tanaka teaches that recording position is shifted by a distance substantially equal to twice the distance between the peaks of the zeroth-order diffracted light or the first-order diffracted light of the signal light beam. However, the present invention (e.g., the exemplary aspect of claims 7 and 31) may define the size of each hologram recording area instead of the shift amount of the recording position. Thus, the subject matter of claims 7 and 31 is not taught or suggested by Tanaka.

Therefore, Applicant submits that these references would not have been combined and even if combined, the combination would not teach or suggest each and every element of the claimed invention. Therefore, the Examiner is respectfully requested to withdraw this rejection.

### III. FORMAL MATTERS AND CONCLUSION

Applicant notes that replacement sheets for Figures 1-2 are submitted herewith, which label these figures as "Prior Art", as suggested by the Examiner.

Applicant also submits herewith a Replacement Sheet for Figure 5 which is amended to accurately show the features already described in the specification. In particular, Figure 5 is amended to more accurately reflect the description provided in the paragraph from line 8 of page 30 to line 15 of page 31.

The first full paragraph of page 31 of the specification describes that the diameter (d2) of the gate light is set to  $d1 > d2$  with respect to the Fourier spectrum distance (d1). The distance d1 is typically shown in Figure 6.

The diameter d2, on the other hand, pertains to the size of the gate light beam 22 illustrated in Figure 5. Therefore, the attached Replacement Sheet for Figure 5 adds the indication of the diameter (d2). In this connection, Applicant notes that the length of the arrow under the letter "r" in Figure 5 should be halved as indicated in the attached Replacement Sheet, because "r" represents the radius of the gate light beam as described on line 15 of page 29 in the Application.

Furthermore, the sign "PG" in Figure 5 represents the gate light pitch (at the time of a feed (or shift) of the gate light). Therefore, a change is made to the arrow under the sign PG in the attached Replacement Sheet for Fig. 5.

In view of the foregoing, Applicant submits that claims 1-7, 17-26, 28 and 31-38, all the claims presently pending in the application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

Serial No. 10/098,616  
Docket No. PU01-01169

15

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

Date: 1/26/04



Phillip E. Miller, Esq.  
Registration No. 46,060

**McGinn & Gibb, PLLC**  
8321 Old Courthouse Road, Suite 200  
Vienna, VA 22182-3817  
(703) 761-4100  
**Customer No. 21254**